

CASE STUDY

WATERTOWN, USA

Watertown is a community of 10,000 residents that relies exclusively on groundwater as a source of water supply. The city is experiencing growth but at a slow pace. The primary mission of the water department is to provide all customers with a safe, adequate and reliable supply of water at a reasonable cost. Particular focus is on its critical customer base to provide basic water needs. Fire flow to the industrial area and downtown commercial section is also important.

The Blue River passes through town resulting in a portion of the service area being located north of the river. A total of five wells serve the city. Limited treatment is provided and consists of sodium hexametaphosphate feed for iron sequestering, hydrofluorosilicic acid feed for dental health protection and gas chlorine feed for disinfection. Average day demands are currently at 1 mgd with maximum day demands approaching 2 mgd. The water department is staffed with six full time employees; two employees are normally located in the downtown office and four employees work out of the water department maintenance garage located adjacent to the city park.

Well number one is the oldest well located downtown and now serves mainly as a standby source of supply. It is provided only with sodium hypochlorite chlorine feed. The well is high in iron and is the cause of red water complaints when used but otherwise complies with all current primary drinking water standards.

Wells 2, 3 and 4 are located in the city park and feed through a single collector main into a treatment building. There phosphate, fluoride and chlorine gas are fed prior to the flow being high lifted into the distribution system. Two high lift pumps take direct suction from the well collector and discharge into the distribution system via a single 10-inch main.

Well 5 is the newest well and is located in a wooded area approximately a half mile outside the city limits. Phosphate, fluoride and chlorine gas also are fed at this well site.

The well and high lift pump capacities are as follows:

Well 1 – 400 gpm

Wells 2, 3 & 4 – Each at 500 gpm

Well 5 – 1000 gpm

Two high lift pumps – One @ 500 gpm; One @ 1000 gpm

Two electrical substations fed off a single major transmission line serve the city; one

and the chemical feeders. The generator at well #5 can provide full power to the well pump and chemical feeders.

Two elevated storage tanks each at the same overflow elevation provide system storage. The north side multi-leg tank has a capacity of 100,000 gallons and is fenced with locking gate; the south side single pedestal tank has a capacity of 500,000 gallons and is not fenced. A single 10-inch river crossing transmission main feeds the service area north of the river. A single 16-inch transmission line extends into the city from well #5.

The city park wells and treatment plant are located inside a six foot high chain-link fence with a padlocked gate. The treatment plant is located adjacent to the water department maintenance building. Well #5 is provided with a six foot high chain-link fence and locking gate. Well #1 is not provided with a fence. All doors to the well houses and treatment plant are equipped with the original standard key locks and are normally locked. The park wells fence gate is unlocked during daytime hours. Keys are provided to each of the four employees who work out of the water department maintenance building. Keys to the elevated storage tanks and well houses have also been provided to the city's well maintenance contractor and to the microwave antenna contractors that rent tower space for their telecommunications systems.

Water department staff makes daily checks at each well and the treatment plant. Monthly bacteriologic samples are taken at each well. The city conducts weekly bacteriologic monitoring from four locations in the distribution system. Chlorine residuals are recorded at the time distribution system bacti monitoring occurs.

All water department records are securely located in the water department office building downtown. The downtown office building is open to the general public for bill paying during normal business hours. Limited SCADA controls are located in the treatment building. No cyber protection policies or software are in place. No other water system security measures are incorporated.

Scheduled chemical delivery is made to the treatment plant building loading dock during daytime hours when the gate is normally open. Invoices are left on the loading dock unless department employees are present. Thirty gallon carboys of fluoride acid, 50 gallon drums of phosphate and 150 lbs chlorine gas cylinders are normally delivered every two weeks. Water department maintenance workers move the chemical deliveries to inside the treatment building and out to well #5 usually within two days of delivery.

Given the park setting for wells 2, 3 & 4 and the treatment building, local law enforcement typically patrol the area every 4 to 6 hours. Normal response time is under seven minutes. Water department staff is not aware of any threats against the water system. Periodic acts of vandalism against the north side elevated storage tank occur.

Critical customers include the hospital, nursing home, school complex and the industrial park area. One of the area's largest employers is located in the industrial park.

The city maintains a supply of repair parts and fittings for all sizes of mains and valves in their system and also maintains construction equipment needed to do only routine basic repairs.

Much to the city's credit, the water department actively carries out state approved cross connection control and wellhead protection programs. A routine valve operation and hydrant-flushing program is also practiced and detailed records of these and other maintenance activities are on file. An up-to-date general plan of the water distribution system, contingency plan, and a recent reliability study of the overall water system are also on file.

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